NOTES ON GARRYA WITH DESCRIPTIONS OF NEW SPECIES AND KEY.

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ANYONE who has done field work in California among the brush-covered hills will appreciate the puzzling character of Garrya. Like Salix, it is dioecious and is rarely found in flower and fruit at the same time, so that in the different herbaria of the country the species are quite inadequately represented and the types very unsatisfactory.

It is impossible with the present knowledge of the genus to attempt more than a provisional arrangement. The species bloom in the depth of the winter months, when few think of collecting plants; they fruit in August or September, when it is dangerous in many places to explore the dry hills on account of the scarcity of water and the density of the brush. In some years the fertile bushes bear no fruit and always seem few in comparison with the sterile ones, so that it is possible to pass through a region where these shrubs grow, at the right time of the year, without discovering a single plant in fruit.

For some time I have been interested in the two species that grow on Mount Tamalpais, across the Golden Gate from San Francisco. They seem to represent the two groups into which the Californian species fall. *Garrya elliptica* has peculiar pubescence, consisting of curly hairs which form a more or less dense tomentum on the lower surface of the leaves and young fruit. The berries, when ripe, are not unpalatable. The seeds are surrounded with an acid pulp which is very slightly tinged with bitterness. *Garrya rigida*, the other species, has fruit so bitter that one taste will suffice for a lifetime. This is commonly known as "quinine-bush." The pubescence is sparse and consists of almost straight, silky hairs, regularly appressed upward.

The genus may be divided into two great sections, the northern and the southern, the former characterized by non-branching aments; the latter with some or all of the aments branched,

generally near the base. There are also two kinds of pubescence in each class. In one the pubescence on the lower surface of the leaves is formed of curly or curly and wavy hairs intermixed to form a dense tomentum; in the other the pubescence, when present, consists of almost straight hairs, generally upwardly appressed and silky in texture.

In the following key these characteristics have been used to classify the different species, and, until they are better known in flower and fruit, it seems the only possible way and may perhaps accord with the natural affinities.

PROVISIONAL SYNOPSIS OF THE SPECIES OF GARRYA.

* *Aments not branched.*

Pubescence of tangled, curly, or wavy hairs.

Garrya Veatchii Kellogg Proc. Cal. Acad. **5**: 40.
Palmeri nom. nov.
undulata var. nov.
elliptica Lindl. Bot. Reg. *pl. 1686.*
Congdoni sp. nov.

Pubescence of upwardly appressed, almost straight, silky hairs.

Garrya buxifolia Gray. Proc. Am. Acad. **7**: 349.
flavescens Watson Am. Nat. **7**: 301.
pallida Eastwood Proc. Cal. Acad. III. **2**; 267.
rigida sp. nov.
Fremontii Torr. Pac. Rail. Rep. **4**: 136.
laxa var. nov.

* * *Some of the aments branched.*

Pubescence of curly hairs.

Garrya ovata Benth. Pl. Hartw. 14.
Lindheimeri Torr. Pac. Rail. Rep. **4**: 136.
macrophylla Benth. Pl. Hartw. 50.
oblonga Benth. Pl. Hartw. 50.
longifolia Rose (in herb).[1]

[1] This is doubtfully placed here. There seem to be two different species of Pringle's collection with this name, and I do not know which is the type. One seems too near *G. laurifolia*.

Pubescence of upwardly appressed, silky hairs.

Garrya laurifolia Benth. Pl. Hartw. 14.
salicifolia sp. nov.
Wrightii Torr. Pac. Rail. Rep. **4**: 136.
Fadyeni Hook. Ic. Pl. *pl. 333*.

GARRYA VEATCHII Kellogg.—Leaves ovate-lanceolate, acuminate at apex, rounded or oblique at base, entire or the youngest leaves very slightly undulate; upper surface except in youngest leaves smooth and shining, lower densely clothed with white tomentum consisting of short, very fine, closely curled hairs. Berries densely clustered and rounded at base without a sign of point or pedicel, apex beaked by the united base of the styles, calyx divisions minute, completely hidden amid dense hairs at top, a short distance below the styles.

The berries are so closely clustered and sessile that none of the involucres except the very lowest are visible in the type. The type was collected on Cedros Island by *Dr. Veatch* and is now in the Herbarium of the California Academy of Sciences.

GARRYA VEATCHII **Palmeri,** nom. nov. (*G. flavescens Palmeri* Watson Bot. Cal. **1**: 276).—Placed here on account of the character of the pubescence, which is that of *G. Veatchii* instead of *G. flavescens*. Distinguished from typical *G. Veatchii* by the broader leaves, generally oval, shortly acuminate or almost aristate, slightly undulate. Berries cuneate at base, the lower almost pedicellate; apex beaked by the united base of the styles and the two calyx divisions, which are prominent and close to the base of the styles; involucres even of the ultimate flowers easily distinguished and the lower conspicuously foliaceous.

The type was collected by *Dr. E. Palmer* at Milquatay, 60 miles (95 km) from San Diego on the road to Fort Yuma. This, as well as two specimens collected by *C. R. Orcutt*, one near Campo, Lower California (no. 900) and one from Hansons, Lower California, April 21, 1885, are in the Gray Herbarium. Here belong also no. 899 (*H. M. Hall*) collected on dry slopes in Lytle Creek Cañon, Southern California, April 24, 1898, and no. 2805 (*L. R. Abrams*) from the same locality, July 15, 1902.

GARRYA VEATCHII **undulata,** var. nov.—Differs from typical *G. Veatchii* in having oval or elliptical obtuse or aristate leaves

with undulate margins; berries cuneate at base and so densely clustered as to conceal upper involucres; calyx divisions hidden in dense wool and at some distance below the base of the styles.

This is represented in the Gray Herbarium by specimens collected by *O. D. Allen* at Pasadena, February 1885, and by a fragmentary specimen collected by *H. C. Ford* at Santa Barbara, April 1881. The best and most complete specimens have been collected by *George Grant* on Echo Mountain, back of the hotel. This mountain is a spur of Mount Lowe.

GARRYA ELLIPTICA Lindl.—This species is common in the Coast Mountains and extends from the Columbia River on the north to the southern part of the Santa Lucia Mountains on the south. Easily distinguished from other species by the large oval or elliptical leaves, strongly undulate. There is a great contrast between the almost smooth, dark green, glossy upper surface of the leaves and the white tomentose lower surface clothed with densely matted curly and wavy hairs. The calyx divisions are so small, so close to the pointed base of the styles, and so concealed by the dense wool that it is only by the most careful search that they can be found. The berry is abruptly short-acuminate at base. The bushes that grow in the inner range of hills have narrower and more pointed leaves than those that grow near the coast; but in all other respects seem identical.

Garrya Congdoni, sp. nov.—Stems brownish-red, youngest twigs white-tomentose. Leaves narrowly oblong to oval and elliptical, 3–5 ^{cm} long, 1–3 ^{cm} wide, tapering at both ends with recurved mucro at apex; petiole stout, keeled, 5 ^{mm} long; margins glabrous, thickened, entire or slightly undulate; upper surface glossy, yellowish-green, sparingly pubescent with curly or wavy hairs, the lower clothed with dense white tomentum consisting of curly and wavy hairs somewhat upwardly appressed but matted and tangled; veins distinct. Staminate aments numerous, varying in length; involucres cuneate at base, short-acuminate at each end with an obscure rounded tooth on each side of the middle, densely tomentose throughout, pedicels surpassed by the perianth; perianth with oval divisions united at top and clothed with long, wavy hairs.

Neither the pistillate flowers nor the fruits have been collected. The type was collected by *J. W. Congdon*, in whose honor it is named, near

Coulterville, Mariposa county, January 1898. Besides this, which was distributed by Mr. Congdon to various herbaria there is another specimen in the Gray Herbarium, collected by *Mr. Congdon* at Benton Mills, Mariposa county, July 5, 1898; also one in the Herbarium of the California Academy of Science collected by *Dr. C. Hart Merriam* on the Merced River, September 1902. A specimen collected by the author on the ridge between New Idria and Hernandez in San Benito county with immature fruit is also placed here. The young berries are rounded or abruptly pointed at base; the two calyx appendages are minute, closely appressed to the styles, and so densely clothed with long wavy hairs as to be hidden by the dense pubescence of the pointed base of the styles.

GARRYA BUXIFOLIA Gray.—Low, spreading shrub; leaves in typical specimens small, about 2^{cm} long, 1–1.5^{cm} wide, oval to elliptical or ovate, entire mucronate rounded or slightly oblique at base, the upper surface dark glossy green, lower densely white tomentose with almost straight silky upwardly appressed hairs; berries becoming subglabrous, beaked base of styles with small calyx divisions appressed.

The type was collected on Red Mountain, northern Mendocino county. Howell's specimens from Waldo, Oregon, have much larger leaves and smaller calyx divisions. It is abundant on the hills along the Crescent City road near Gasquet's.

GARRYA FLAVESCENS Watson.—Shrub with yellowish-gray aspect, young stems tomentose with a close, upwardly appressed pubescence of fine, almost straight, silky hairs; lower surface of leaves with similar pubescence, upper with scattered hairs irregularly appressed, Leaves broadly oval to narrowly elliptical, pointed at both ends, apex tipped with a sharp recurved mucro, veins strong and distinct; petioles 0.5–1^{cm} long; margin glabrous, entire.

The type specimen from the Gray Herbarium, collected by *Dr. E. Palmer* at St. George, southern Utah in 1887 (no. 183½), has unusually long and slender styles on the very immature fruit. A specimen from Kanab Plateau, collected by *Alfred Weatherill*, August 5, 1897, has fruit more mature, with the styles almost gone. On none of the berries examined could any trace of calyx divisions be found. This species seems to be confined to Utah and New Mexico and the adjacent country probably, but it is very near the next.

GARRYA PALLIDA Eastwood.—Distinguished readily in the field by the glaucous-gray tone of the entire plant, which does

not come from the pubescence but is noticeable where the leaves are almost smooth. Leaves large, oval to elliptical, entire, acute at each end with a recurved mucro at apex; petioles 1–1.5 cm long; pubescence sparse, upper surface of leaves generally glabrous except when young. Involucres deeper than in *G. flavescens*, being about 3 mm at the middle while the preceding is about 1 mm. Calyx divisions close to the beak of the base of the styles and concealed in the young fruit by dense hairs.

Grows in the Southern Sierra Nevada where *Pinus monophylla* is found or in the Coast Mountains where *Pseudotsuga macrocarpa* grows. Specimens are in the Herbarium of the California Academy from Kings River Cañon, San Emidio Cañon, Tehachapi, Kaweah Cañon, and Zaca Mountain, Santa Barbara county. The last-named specimens were collected by the author, June 1902, and have smaller, narrower leaves than specimens from other localities.

Garrya rigida, n. sp.—Erect shrub, 1--2 m high, with older stems gray-brown, becoming darker with age, youngest generally red though sometimes green, glabrous throughout except for a sparse, appressed pubescence on the younger stems, leaves, and bracts. Leaves elliptical-obovate, thick, coriaceous, entire, bright green, noticeably reticulate, 5 cm long, 2.5 cm wide on an average, tipped with an obtuse mucro, tapering at base to a thick petiole 1 cm long; petioles connate-clasping. Aments fascicled or sometimes solitary at the ends of the branchlets, 1–1.5 cm long or less, with 5–15 involucres connected by the peduncle which between each involucre becomes longer than the stamens; lowest involucres with recurved foliaceous tips as long as the body of the involucre, upper tipped with stiff points which diminish towards the ultimate flowers; body of the involucre green or red, generally tipped with green, pubescent at the middle and base. Flowers on filiform pedicels, 5–6 mm; divisions of perianth green, 1-nerved, linear, white-hairy at top, 5 mm long, glabrous on inner side, united at tip, but later separating; stamens green, changing to yellow, with anthers 2 mm long, longer than the filaments. Pistillate aments rigid, 1–4 cm long, with the involucres closely imbricated and green, in other respects resembling those of the staminate flowers; flowers apetalous, 6 to each involucre, 2 styles to each pistil, black, narrowly subulate, sparingly clothed with

white hairs, as long as the ovary; ovary green, clothed sparingly at base and densely at apex with white upwardly appressed hairs. Fruit slightly pubescent, purplish-gray, densely clustered, very bitter.

Grows in the Coast Mountains of California and its range seems to be from Trinity to Monterey counties. The type locality is on Mount Tamalpais. It is quite abundant on what is known as the Bill Williams Trail from Eldredge Grade to Rock Spring, and has also been found along the railroad track.

This species has been included under *Garrya Fremontii* Torr., which is a species of the Sierra Nevada and the mountains of northern California and Oregon. The southern limit of *G. Fremontii* seems to be the Yosemite, where it is abundant along the road from Inspiration Point and also near Vernal and Nevada Falls.

Garrya rigida is different from *G. Fremontii* in habit, pubescence, inflorescence, and the fruits. Those of *G. rigida* are purplish, tinged with gray; those of *G. Fremontii* are black when dry.

It is much nearer *G. pallida* Eastwood, but differs in the bright instead of glaucous green foliage. Flowering specimens of *G. pallida* have not been collected, so good comparisons cannot be made; but the appearance of the two as they grow is quite different, as well as their range and environment.

GARRYA FREMONTII Torr.—Typically almost entirely glabrous, leaves rather small, not more than 4^{cm} long, and 2^{cm} wide, with cuneate base and mucronate apex. Staminate aments slender, with a few scattered hairs, more dense on the margins and near the tip of the two teeth. The stamens seem to be yellow and are exserted from the open sides of the sepals, which are united at the top. As the type has only staminate flowers it is impossible to compare the other parts with what seem the same species from other parts of the state.

The nearest of all the specimens in the Herbarium of the California Academy of Sciences is one collected by *C. A. Purpus* on Eel River, Mendocino county. This has much larger leaves but the staminate catkins are the same. Specimens from the Yosemite with immature fruit have the large leaves of the Eel River plants and almost sessile berries with inconspicuous calyx divisions. These characteristics hold true also with specimens collected on Mount Bohemia, Oregon, in the Callipoia Range, June 14, 1902, by *P. E. F. Peredes.*

GARRYA FREMONTII **laxa**, var. nov.—Distinguished from the forms included under *G. Fremontii* by the longer petioles of

the leaves, 2^{cm} or more, the more loosely fruiting aments, the peduncles more than twice as long as the involucres, and the pedicels equaling or surpassing the involucres. The berries, which turn black when dry, are tipped with the two styles and the conspicuously spreading calyx divisions opposite, giving the appearance of four styles when the stigmas have disappeared The pedicels in some of the staminate flowers are twice as long as the involucres, and in the fruiting aments vary from once to thrice as long.

This was abundant at Twin Lakes, the head waters of Cañon Creek, Trinity county, and was collected with immature fruit July 10, 1901. A single bush with dried staminate aments was found from which the comparison with the flowers of typical *G. Fremontii* was made.

Garrya salicifolia, sp. nov.—Stems slender, diffusely branched, marked and roughened by the lenticels; younger stems slightly pubescent. Leaves lanceolate, attenuate at each end, thin and coriaceous, veiny, glabrous or with few fine, scattered hairs chiefly on the margins, 3–6^{cm} long, 1–1.5^{cm} wide; petioles slender, 5–10^{mm} long, angled, pubescent. Aments erect in fruit, sparingly branched at base, slender, angled, slightly pubescent; bracts similar to the leaves but much smaller, 5–10^{mm} long, 1–2^{mm} wide. Berries globose, subsessile, generally two to each whorl, tipped when the styles fall away with a roundish, rough cap.

This is no. 259 Brandegee. It was collected at Sierra de la Laguna, Lower California, January 23, 1890. The smooth, willow-like leaves are very characteristic and sufficiently distinguish it from allied species. It is related and nearest to *G. laurifolia* Benth., but that has much larger leaves and differently shaped berries. It also approaches *G. longifolia* Rose, from which it differs in pubescence, foliage, and habit.

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